

How to Cite:

William, S. J., Omobolanle, N. M., & Oshionebo, E. (2022). Information and communication technology (ICT) utilisation, skillfulness and students' academic performance in Liberian Universities. *International Journal of Health Sciences*, 6(S3), 8169–8180. <https://doi.org/10.53730/ijhs.v6nS3.7948>

Information and communication technology (ICT) utilisation, skillfulness and students' academic performance in Liberian Universities

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Abstract---Information and communication technology (ICT) has been found to be very important in enhancement of academic performance of students in tertiary institutions. This study investigated the influence of ICT on the academic performance of students in two selected universities in Monrovia, Liberia. Primary data was collected from 110 randomly selected students from both universities. This was carried out by using a well-structured questionnaire. Descriptive Statistics and OLS regression analyses were used to analyze the data, while Analysis of Variance (ANOVA) was used for test of hypotheses. The findings from results indicate that many (88.2%) of the students have smart phones; majority (78.2%) has access to internet facilities at home; a good number (56.4%) used internet services on daily basis; about 40% spent 1-2 hours on internet each day. Considering computer-related activities, an average student was skillful mainly in email, Microsoft word and Powerpoint. The study shows that possession of laptop and access to university desktops had positive significant influence on students' academic performance. However, possession of smart phones and tablets had negative significant influence on students' academic performance. Also, student's skillfulness in powerpoint, email and learning management system had positive significant influence on their academic performance, while skillfulness in multimedia had negative significant influence on students' academic performance. The study finally shows that there was significant relationships between use of ICT facilities and level of

skillfulness in ICT facilities and academic performance among the sampled students in the selected Liberian universities. Proper and adequate utilization of ICT by school administrators and students was recommended. Also, a downward review of costs of internet facilities was recommended for improved usage of internet services towards enhanced students' academic performance.

Keywords--ICT, academic performance, ICT facilities, computer-related, activities skillfulness.

Introduction

Information and Communication Technology (ICT) is Information Technology (IT) with emphasis on communication tools. It comprises internet, Wi-Fi, cell telephones, and other mediums of communication, consisting computers and vital company software, storage, audio-visible structures, middleware that allows customers to contact, shop, transfer, and manage data (Shamim Talukder, 2015). ICT has a vital part in establishing the new international economic system to provide fast changes in the world. In preceding era, the developed countries have advanced to the extent that the developing nations might be unable to catch up. ICT offers the incentive for the present world in such ways that the essential concepts of technologies have become an important factor of learning (UNESCO, 2002). ICT enables learners to understand difficult concepts in very simple way through simulations when presented to real life situations. Hence, ICT plays the role of dynamic learning oriented facilitator that foster the learner to develop and enhance higher order thinking (Alexander, 1999). The main prerequisite for learners is to get assistance from this innovation but it depends on the level of accomplishment and understanding of these vital technologies and realizing essential technological skills (Trpkovska, 2010). For increasing the academic achievement of pupils, conventional teaching methods are required to be up-to-date. ICT technology uses Computer Assisted Instruction (CAI) for time-independent learning and teaching. This makes it easy for students to go through the system at home or on their computer. CAI increases learning levels, making novices to learn more by offering the same length of time as classically taught learners (Hussain, Suleman, Din & Shafique, 2017).

The influence and practices of ICT have become an evolving area of argument especially in education sector. Educational institutions are adopting the methods of teaching which consists of ICT and its offering into associated educational programs (Shamim Talukder, 2015). High-tech classrooms and facilities such as projectors, TV and radio transmitting and receiving devices, smart communication panels, screens and teleconferencing systems, are all consequences of extensive use of ICTs. Furthermore, the use of ICTs in education field has been emphasized to help instructors and learners with a broad array of skills. The quality of instruction and managing of educational activities can be enhanced through the use of ICTs (Shaheen and Khatoon, 2017). Instructors use ICT to adapt the pedagogical techniques in order to enhance growth performance of the pupils. Instructive institutions are adopting ICT based teaching technique

and its related instructional programs for the students to teach. Students are availing the ICT services using some smart devices and the internet.

One puzzling question is the effective impact of these technologies on student achievement and on the returns of education. Many academic researchers have tried to answer this question at the theoretical and empirical levels. They have faced two main difficulties. On one hand, student performance is hard to observe and there is still confusion about its definition. On the other hand, ICT is evolving technologies and their effects are difficult to isolate from their environment. There is no standard definition for student performance. The standard approach focuses on achievement and curricula, how students understand the courses and obtain their degrees or their marks. However, a more extensive definition deals with competencies, skills and attitudes learned through the education experience. The narrow definition allows the observation of the outcomes of any change in higher education, while the more extensive definition needs a more complex strategy of observation and a focus on the labor market. The outcomes of education are mainly validated in the labor market.

Statement of the Problem

It has been widely acknowledged that ICT facilities can be used to improve the quality of teaching and learning at any level of education. In fact ICT facilities are becoming part of the daily tools for teaching and learning. Thus, their use in education by teachers and students is becoming a necessity. It is a known fact that the students of tertiary institutions in Liberia undergo learning with little or no access to the necessary ICT facilities. Lack of ICT facilities affects their interest and motivation in teaching and learning. Akale (2006) posited that students' academic performance can only improve if all the facilities required in teaching and learning the course are available and properly being used in teaching the students in this ICT era. So it is important to measure the students' behavior towards ICT services usage and also its effects on their performance (Shamim Talukder, 2015). The inadequate or lack of ICT facilities appears as significant barriers in students ICT usage in the country. Hence, this study aims at identifying the effect of skillfulness of ICT usage on academic performance of students.

Statement of Hypotheses

The following hypotheses are stated for the study:

- Ho1: There is no significant relationship between usage of ICT facilities and academic performance among students in the selected Liberian universities.
- Ho2: There is no significant relationship between level of skillfulness in ICT facilities and academic performance among students in selected Liberian universities.

Methodology of the study

Study area

Liberia has a total of 2 public and 12 private universities; 7 of them are situated in the capital Monrovia. This study was carried out among the universities in Monrovia. The capital city was purposively selected because of relative availability of internet services compared to other towns in the country.

Sample Size and Sampling Techniques

The data for this study was collected from two selected universities in Monrovia. These are Cepres International University and Blue Crest University College. Students that were in their 2nd to 4th year were purposely sampled for the study because they would have obtained their grades after 2 semesters of their academic programs. A total of 110 students were randomly selected from science based departments in both selected institutions. The data were collected using a well-structured questionnaire. The questionnaire was designed to obtain personal information and students' academic performance. The data collected include gender, use of ICT, frequency of internet usage, length of time for surfing the internet, and CGPA. Other information collected include students' computer application skills (by using the 5-point Likert scale).

Data Analysis Procedures

Descriptive statistics were used to determine the extent of uses of ICTs by the selected students. Regression analysis was used to identify the ICT variables that had effects on academic performance of students. The Chi square and Analysis of Variance (ANOVA) were used for the test of the hypotheses. The first adopted ordinary least squares regression analysis for this study is stated thus:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \mu \dots\dots\dots (1)$$

Where, the dependent variable Y is the Academic performance (CGPA), X_1 = possession of personal desktop, X_2 = possession of personal laptop, X_3 = possession of personal smart phone, X_4 = possession of personal tablet, X_5 = access to university desktop, X_6 = access to university laptop, X_7 = access to home internet, β_1 to β_7 = parameters to be estimated, and μ = Disturbance term.

The second adopted ordinary least squares regression analysis for this study is stated thus:

$$Y = \alpha_0 + \alpha_1Z_1 + \alpha_2Z_2 + \alpha_3Z_3 + \alpha_4Z_4 + \alpha_5Z_5 + \alpha_6Z_6 + \dots\dots + \alpha_{13}Z_{13} + \varepsilon \dots\dots\dots (2)$$

Where the dependent variable Y is the Academic performance (CGPA), X_1 = Ms Word skillfulness level, X_2 = Ms Excel skillfulness level, X_3 = Power point skillfulness level, X_4 = Email skillfulness level, X_5 = Search engine skillfulness level, X_6 = Databases skillfulness level, X_7 = Multimedia skillfulness level, X_8 = Graphic editing skillfulness level, X_9 = Digital audio skillfulness level, X_{10} = Video editing skillfulness level, X_{11} = Webpage design skillfulness level, X_{12} = Learning

Management System skillfulness level, X_{13} = Web tools skillfulness level, α_1 to α_{13} = parameters to be estimated, and ε = Disturbance term. The F-test, R^2 and other statistics were accomplished by using SPSS version 20.

Result and Discussion

Demographic characteristics of the respondents

Table 1 above shows the demographic characteristics of the selected students.

Table 1
Demographic characteristics of the respondents

Demographic Characteristics	Frequency	Percent	Mean
<i>Gender:</i>			
Male	48	43.6	
Female	62	56.4	
<i>Age:</i>			
Less than 21	5	4.5	28.1 ± 0.97
21 – 25	55	50.0	
26 – 30	13	11.8	
31 – 35	22	20.0	
36 – 40	4	3.6	
41 & above	11	10.0	
<i>Year of study:</i>			
2 nd	37	33.6	
3 rd	37	33.6	
4 th	36	32.7	
<i>Disability:</i>			
Disabled	31	28.2	
Non-disabled	79	71.8	
<i>Mode of study:</i>			
Traditional	39	35.5	
Online	3	2.7	
Blended	68	61.8	

Majority of the respondents were female (56.4%), while 43.6% of them were male. This implies that there is no serious marginalization against any particular gender with respect to access to education and educational tools in the area of study. The average age of the respondents was 28 years. Majority (50%) of the respondents were within the age bracket of 21 – 25 years. About 20% of them were within the age bracket of 31 – 35 years. This implies that majority of the respondents in the study area were within the twenties and early thirties. The year of study of the respondents shows that there was a relative balance in the selection of the students with minimal bias. About 28% of the respondents had physical or learning disabilities that required accessible and adaptive technologies for studies. This implies that attention might be required in addressing the educational needs of the individuals with physical challenges in the area of study. Majority (62%) of the respondents adopted blended learning as mode of study,

while 36% of the respondents adopted traditional face-to-face method as mode of study. This implies that blended learning is not an uncommon phenomenon in the area of study.

Possession of ICT facilities

Table 2
Possession of ICT facilities among selected students in study area

ICT facilities	Frequency	Percent
Personal Desktop	9	8.2
Personal Laptop	29	26.4
Personal Smart phone	97	88.2
Personal Tablet	2	1.8
University desktop	42	38.2
University laptop	33	30.0
University wifi	20	18.2
Home internet	86	78.2

Table 2 shows that majority of the students possess smart phones (88.2%); while 78.2% had access to internet facilities in their homes. About 26.4% had personal laptops, while very few had desktops (8.2%) and tablets (1.8%). About 38.2% of the selected students had access to university desktops, and only about one third (30%) had access to university laptops. Few (18.2%) had access to university Wi-Fi. This implies that school administrators could focus on online management programs that could be accessible on smart phones in the comforts zones of individual homes. This could bring about improved academic performance of students in the study area.

Table 3
Rate and time spent on internet usage among selected students in study area

Item	Frequency	Percent
Rate of internet usage		
Daily	62	56.4
Alternate days	7	6.4
Once weekly	11	10.0
Irregularly	7	6.4
Rarely	9	8.2
Never	14	12.7
Time spent on internet usage (hours)		
0	14	12.7
Less than 1	25	22.7
1 – 2	44	40.0
3 – 4	11	10.0
More than 4	16	14.5

Table 3 shows the rate and time of use of internet by the selected respondents. More than half (56.4%) of the students made use of internet facilities on daily

basis. About 30% of the students used internet facilities occasionally. About 13% of the selected students never made use of internet. This implies that making use of internet facilities could enhance learning among students in the study area. The table also shows the amount of time spent by the selected students in surfing the internet. About 40% of the selected students spent 1 – 2 hours in surfing the internet every day. About 23% of the selected students spent less than 1 hour daily in surfing the internet. About 10% spent 3 – 4 hours to surf the internet every day, while 14.5% of the selected students spent more than 4 hours on internet. However, about 13% did not have anything to do on internet at all.

Skillfulness in computer-related activities

Table 4
Skillfulness in computer-related activities among selected students in study area

Computer-Related Activities	Score (out of 5)	Skillfulness (%)	Rank
Ms Word	1.96	39.2	2
Ms Excel	1.54	30.8	4
Power point	1.96	39.2	2
Email	2.3	46.0	1
Search engines	1.24	24.8	7
Databases	1.32	26.4	6
Multimedia authoring	1.08	21.6	13
Graphic editing	1.2	24.0	12
Digital audio	1.46	29.2	5
Video editing	1.24	24.8	7
Webpage design	1.22	24.4	7
Learning management system	1.24	24.8	7
Web tools	1.24	24.8	7

Table 4 shows the level of skillfulness of the respondents in computer-related activities. The skills of the students in each of the activities were determined by using Likert scale. Non-skillful was scored 1; little skill was scored 2; satisfactory skill was scored 3; good skill was scored 4; very good skill was scored 5. The average scores were computed for each activity, and percentage skillfulness was determined thus:

$$\text{Skillfulness} = \text{Average Score} / \text{Maximum score (5)} * 100\%$$

The students had highest skillfulness in email (46%); Ms Word and PowerPoint (39.2%); Ms Excel (30.8%). They had least skillfulness in application of search engines, video editing, webpage design, learning management system, and web tools. This implies that if there would be improvement in academic performance of students, school administrators should consider incorporating school systems with involvement of email, Ms Word, PowerPoint and Ms Excel.

Distribution of respondents according to academic performance

Table 5
Distribution of respondents according to academic performance among selected students in study area

Grade	Frequency	Percent
C+	7	6.4
B-	42	38.2
B+	48	43.6
A-	2	1.8
A+	11	10.0

Table 5 shows the distribution of respondents based on academic performance. Majority (44%) of the selected students had B+; 38% of the respondents had B-. These two categories made up of 82% of the total selected students in the study area.

Effects of ICT-related variables on students' academic performance

Table 6
ICT-related variables that affect student academic performance among selected students in study area

Variables	Coefficient	Standard error	t Statistic
Constant	1.5611	0.1553	10.0525
Personal Desktop	-0.1524	0.2037	-0.7482
Personal Laptop	0.2997	0.1436	2.0875**
Personal Smart phone	-0.4599	0.2216	-2.0755**
Personal Tablet	0.2257	0.1260	1.7910*
University desktop	-0.1091	0.1493	-0.7308
University laptop	-0.4316	0.1380	-3.1277***
Home internet			
R ²	0.6117		
F value	42.3319		

Table 6 presents the Ordinary Least Square (OLS) regression analysis that identifies the ICT-related variables that affected students' academic performance. The ICT-related variables that influenced academic performance of the students were possession of personal laptop, smart phone, tablets, access to university desktops, and presence of internet facilities at home. The result shows that possession of personal laptops resulted in improvement of academic performance of the selected students. This is expected because laptops are very essential for academic purposes. It is observed to have become a basic necessity in educational programs. This is similar to the findings of Sosin et al. (2004), Agarwal and Day (2000), Polly (2011), Ziden et al. (2011), and Carrillo et al. (2010). But the findings of this study is different from the observation of Conrad (1997) and Goolsbee and Guryan (2002) who reported that increased uses of computer and internet connections have no impact on student's achievement. The result also shows that

presence of university desktops resulted in improvement of academic performance of the selected students. This is anticipated because desktop computers in schools enable activities to be performed with relative ease. It also helps those students that had no personal computers to be helped against ICT marginalization.

Items like possession of personal smart phones, tablets, and presence of internet facilities at homes have negative effects on students' academic performance. This is unexpected; however, it is not impossible. As good and useful these ICT items are, they could result in distractions for the students if they are not used for academic purposes, and are often used for non-academic purposes at the detriment of a student's academic pursuit. This is in variance with Attwell and Battle (1999) who record direct relationship between home computer and school performance. The R^2 of 0.6117 implies that the estimated variables explained up to 61% of the ICT-related factors that were responsible for students' academic performance in the study area.

Effects of Computer-related activity variables on students' academic performance

Table 7
Computer-related activity variables that affect student academic performance among selected students in study area

Variables	Coefficient	Standard error	t Statistic
Constant	1.2608	0.0422	29.9110
Ms Word	0.0589	0.0765	0.7702
Ms Excel	-0.0771	0.0847	-0.9102
Power point	0.4133	0.1073	3.8529***
Email	0.4047	0.1160	3.4889***
Search engine	-0.1035	0.1079	-0.9598
Databases	-0.0217	0.0907	-0.2394
Multimedia	-0.5565	0.3341	-1.6657*
Graphic editing	0.0405	0.1392	0.2908
Digital audio	0.0256	0.0719	0.3553
Video editing	-0.1363	0.1559	-0.8746
Webpage design	-0.0084	0.3238	-0.0260
Learning Mgt System	0.3768	0.1440	2.6165**
	-0.293	0.2433	-1.2041
Web tools			
R^2	0.8576		
F value	87.7001		

Table 7 shows the variables of computer-related activities that affected students' academic performance. The variables include PowerPoint skill, knowledge of email, multimedia skill, and skillfulness in learning management system. The result reveals that possession of high levels of skills in PowerPoint, email, and learning management system enhanced high level of students' academic performance. However, possession of high level of skills in multimedia resulted in poorer academic performance of students. Multimedia is a form of communication

that combines text, audio, images, animations, and video into a single presentation. It includes video podcasts, audio slideshows and animated videos. As good as the multimedia is, it could result in poor academic performance of students if the area of study of the respective student does not require the components, and the student is involved to the detriment of their focus on the field of study. The R^2 of 0.8576 implies that the estimated variables explained up to approximately 86% of the computer-related activity factors that were responsible for students' academic performance in the study area.

Test of hypotheses

Table 8
Test of hypotheses using Analysis of Variance

Hypothesis	Critical value	F value	Decision
H ₀₂ : There is no significant relationship between use of ICT facilities and students' academic performance.	1.96	2.33	Reject H ₀
H ₀₃ : There is no significant relationship in the level of skillfulness of use of ICT facilities and academic performance among students in Liberia	1.96	7.70	Reject H ₀

The rule of thumb states that if F value exceeds the critical value, we reject null hypothesis (H₀). From the result from Table 8, it could be concluded that:

- There is significant relationship between use of ICT facilities and students' academic performance.
- There is significant relationship in the level of skillfulness in ICT facilities and academic performance among students in Liberian universities.

Conclusion and Recommendations

The study reveals that a good number of students lack necessary ICT gadgets. The reason is both the cost of gadgets and the internet accessibility. This makes it difficult to utilize ICT platforms on a regular basis. Truly speaking, ICT gadgets are critical in the access of ICT facilities and searching for information on the internet. Students can use ICTs to facilitate discussions and feedback on academic matters from teachers, seniors, and colleagues. This kind of interaction is necessary to improve their academic system and research skills. This study shows that ICT gadgets contributed to enhanced academic performance because ICTs demand some basic knowledge for anyone to embrace it. In order to appreciate the role of ICT in tertiary education, it is necessary to involve all its functionaries in ICT.

Therefore, all the parties should be involved in a study sequel and understand the components of ICT that are relevant to their respective functional units or departments. Based on the major findings of the study, it could be concluded that Information and Communication Technology (ICT) facilities is one of the modern

instructional facilities used in teaching and learning in our educational institutions. ICT does not only motivate the students, but also increase their interest in learning. Based on the findings and conclusion of the study, the following recommendations are made:

- Educational administrators should make sure that the ICT facilities are properly used in teaching and learning through provision of computer laptops for the use of the lecturers and students as this will encourage them to apply ICT facilities in teaching and learning.
- Parents/Guardians should encourage their children to enroll in ICT programs at early age. This is to help them acquire knowledge and exposure about ICT facilities before attending higher institutions.
- Educational management of institutions should include use of software packages, and training in the use of such packages should be incorporated in school curriculum. This will help students to get use to ICT facilities.
- Downward review of costs of internet facilities should be put into consideration by all concerned stakeholders, especially the service providers, in order to encourage usage of ICTs in educational institutions.
- ICTs should be used solely for educational advancement. Students should guide against unnecessary use of ICT which serves as distractions to their educational goals.

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